

**Title:**

Recycled Battlefield Titanium Scrap for Cold Spray Applications

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**Abstract:**

This work explores the potential utility of on-demand recycled titanium feedstock powder for “in the field” cold spray repair to better support the warfighter while also decreasing equipment and part downtime. Gas-atomization is a widely used technique to produce metallic feedstock powders for additive manufacturing processes such as cold spray. The titanium scrap was atomized from three different grades of titanium using a mobile foundry manufactured by MolyWorks Materials Corporation. Characterization of the three titanium powders was used to optimize cold spray parameters for maximum coating deposition and part quality. The powder and sprayed specimens were characterized using microscopy, particle size distribution (PSD) analysis, powder rheometry, particle compression, Karl Fischer Titration moisture analysis, ONH element analysis, profilometry-based indentation plastometry (PIP), and nanoindentation. Computational thermodynamics and kinetic models are used to guide heat treatment selection for thermal post-processing liquid phase sintering to improve properties of selected consolidated samples. Preliminary results display similar powder particle size, shape, texture, and morphology across recycled powder types. Moisture and ONH content of the powders exhibit acceptable levels for cold spray deposition. Future work includes comparing the mechanical properties and ballistic performance of bulk cold spray consolidations using virgin and recycled titanium feedstock material.